WHAT IS INTELLIGENCE AND WHO HAS IT?

By Professor LIGHTNER WITMER
UNIVERSITY OF PENNSYLVANIA

INTELLIGENCE is the ability to solve a new problem. An unsurmounted difficulty is a new problem so long as its solution is unknown. It is easy enough to cut the Gordian knot, or to stand an egg on end, after one has learned how these historic intelligence tests were solved. When a problem is difficult enough, or the solution sufficiently novel and important, the intelligence displayed in successful invention will be considered "genius."

Life confronts us with problems, new and old. Just to keep one's self alive is a very old one. "To live by one's wits" is to solve it by an exercise of intelligence. From the cunning of a horse trader to the genius of an Aristotle is a long step up on the scale of intellectual competency; but intelligence may appear at any intellectual level, even a low one, and is divined from what the individual makes of opportunity and resources. We ascertain how much knowledge and skill enter into a performance in order to disregard them, for the intelligence displayed in successful adventure is measured not by the resources employed, but by the risks involved and the difficulties overcome. If, for example, the Russian Soviet is in fact a weak form of government, and the Bolshevists are as entangled in ignorance, insanity and crime as would appear from the reading of our daily newspaper, then it follows that the intelligence of a Lenine or a Trotzky must be given a higher rating than the genius of statesmen who have tried in vain to sink this defective ship of state, despite the fact that they have had at their command the intellectual resources of the most cultured and efficient nations of the world. Intelligence is not to be measured by conventional standards, but by the successful outcome of performance. The discrimination of intelligence from other abilities is concerned only with the criteria that distinguish the variable and novel creations of free initiative from the more constant and familiar effects of established habits. The originality of a performance is proportional to the number of novel elements entering into its composition, and to the amount by which a successful creation of the productive imagination varies from the prevailing mode.

The really serious problems of daily life, the primeval and yet

recurrent problems of mere existence were solved long ago by our pre-human ancestors. As a consequence, we are now able to get up in the morning, cook and eat our breakfast, swallow and digest it, without an exertion of intelligence or intellect, employing for the purpose inherited habits which are physiological mechanisms called "instincts" and "reflexes." Throughout a busy day, full of varied performance, one gets on with the day's work, solving problem after problem, many of them difficult enough, some of them possibly beyond the proficiency of all but the most expert or the best informed; but rarely will a new problem emerge from the comfortable routine of a well-ordered existence.

Education is the device of civilization to keep us from encountering new problems. The method employed is showing the pupil how to solve problems instead of letting him solve them for himself. It thus makes the exercise of his intelligence unnecessary. The school presents the paradigm, and when life confronts the graduate with a new problem, he solves it by virtue of an acquired intellectual habit, and in conformity to the scholastic model.

Endow a child with intellect, let him acquire knowledge and efficiency, teach him to conform his conduct, thought and feeling to the prevailing mode, and you go far to assure him a useful life at a high intellectual level. If he has intelligence, it may facilitate the schoolmaster's task, but pupil and teacher can, and do, get along without it. They must, however, avoid an excess of stupidity. They must not try to solve new problems if every attempt brings failure. They must do what the timid do, who fear failure more than they desire success; they must check initiative, censor the imagination, suppress revolt, curb aspiration and refrain from adventure. At this task the pupil will be aided and abetted by the greater number of schoolmasters who will direct his progress from the first year of the elementary school to the commencement day, which yields the certificate of intellectual proficiency called a "diploma." To discover how much intelligence the graduate of this educational system really has, one would have to surprise him at a moment when he is confronted by some accidental obstacle in an otherwise well-ordered existence—a missing suspender button, for instance, for which he must quickly invent a substitute, or some other difficulty connected with the sempiternal problem of making both ends meet.

Competency is an aggregate of many congenital abilities, some of them specific abilities, like talking and singing; others more general, like intelligence, intellect, discernment, will and motivation. By the time a child is six years old he will ordinarily display

all his congenital competency, from which the discerning observer may estimate how much ability he has and judge if he has enough to be considered normal. Let six-year-old children of normal competency grow up without instruction in school subjects, and therefore below the point of literacy on the intellectual scale, and they will be arrested in development at the level which defines the low grade imbecile. Let them, however, grow in stature, strength and endurance, in social conformity and sexual proficiency, and they could raise and support a family, if it were not for the difficulties provided by what in our pride we call "civilization." During the war, some imbecile children in the city of Philadelphia, arrested under the compulsory education law, were earning more than the truant officer who arrested them. It is not the inherent difficulty of earning a living and raising a family which makes the task impossible for those whose mental age is not more than six years; it is the grocer, the landlord and the employer, competitors whom they must outwit in the struggle for existence, ease and comfort. Civilization implies an average intellectual level. The farther a man's intellectual level falls below the mode, the more intelligence he will need.

No one has ever devised an intelligence test that tests intelligence and nothing else. In consequence, the results of so-called intelligence tests have significance only when analyzed and interpreted in relation to a particular set of antecedent conditions and attending circumstances. The Binet intelligence quotient, for example, is a measure of proficiency, and in those making low scores it may indicate anything in the way of ability or deficiency except intelligence. We do not observe or measure intelligence—we observe performance and measure its effects. A few intelligent performances will cause us to anticipate more of the same sort, and even an intelligent look may lead us to expect intelligent behavior. Intelligence is not a fact, but an explanatory concept derived from the observation of facts. It is a diagnostic category like courage or honesty, the diagnosis being in effect the verbal expression of an expectation.

In order to test the ability to solve a new problem, an intelligence test must provide that many members of a homogeneous group will fail, and that all but a few will make many errors before they achieve success. Those who make many attempts in a given time are more likely to succeed than those who make only a few attempts. Intelligence, therefore, is directly proportional to initiative and inversely proportional to the number of errors made, provided the errors are not too few. To measure a performer's intelligence one must know the time required to achieve success, but one must

not neglect to observe the performer at work and to take into the consideration the number and kind of errors made and how he corrects them. Intelligence is displayed through the operation of trial and error. An intelligence test is adjusted to the intellectual level of a group when those who succeed do not outnumber those who fail.

At the Psychological Clinic, an eleven block formboard is employed as an intelligence test. It may be solved in eleven moves in about eleven seconds, but anyone who solves it thus displays efficiency not intelligence. This formboard is an intelligence test at or about the four year old intellectual level, because not more than 50 per cent. of four year old children are able to solve it, even with a time allowance of one hundred seconds. No two year old child has ever passed the test; about 25 per cent. of three year old children have passed it, and approximately 100 per cent. of six year olds. If I know nothing about a particular child except that he is four years old, the odds are even that he will pass the test. If he is three years old, the odds are three to one that he will fail.

Intelligence is displayed in a performance that succeeds against adverse odds; stupidity is failure despite favoring odds. At any moment a future of some sort confronts us, and often we have nothing better than a gambler's guess for guide. When the odds favor failure, we have only a gambler's chance of winning; if we plunge and win despite the adverse odds, we have had a gambler's luck. The success of an intelligent player who uses all the resources at his command to win a fortune, whether at cards or in business, has a very different diagnostic significance from the "dumb luck" of inheriting money or finding it.

Intelligence, then, is a successful leap into the dark. "A man never rises so high," said Oliver Cromwell, "as when he knows not whither he is going." Converting the words of a madman into a slogan of success, Browning thus portrays the morale of the adventurer at the critical moment when success or failure hangs upon the issue of performance:

> There they stood, ranged along the hillsides, met
> To view the last of me, a living frame
> For one more picture! in a sheet of flame
> I saw them and I knew them all. And yet
> Dauntless the slug-horn to my lips I set
> And blew, "Childe Roland to the Dark Tower came."

The achievement of intelligent initiative may be a successful adventure of pioneer or conqueror, the creation of a work of art, a new idea, an invention—some performance, no matter what, so

long as it be original to the performer, the product of an imagination that outruns knowledge, of an ingenuity that outdoes skill.

If this is a novelty to the beholder, it may inspire admiration, appreciation or wonder. If it is too novel, it will arouse distaste, fear and a destroying hatred. The more shocking a product of the creative imagination, the greater the presumption that genius inspired it, provided the production is something worth while.

The American readers of Walt Whitman's "Leaves of Grass" were too shocked to appreciate the singular novelties of thought and diction concealed beneath the innocent botanical title. When he walked the streets of Philadelphia and Camden, he was ignored by those whom a recent French critic calls his "rustic compatriots." Now that French and English writers have discovered him to be the most original of American poets, his peculiar genius is not without honor even in his own country, save only perhaps in those classic centers of intellectual conservatism—the departments of English literature in our universities.

The Declaration of American Independence started a long war; it eventuated in a form of government as new to the Europe of that day as the Russian Soviet is now; it enthused and emboldened the French Revolutionists; it brought in its train the doctrine of self-determination; it helped to promote the Russian revolution and the success of the Irish Sinn Fein; it was signed by men who felt the hangman's noose about their necks, and only the successful outcome of the adventure kept the noose from being drawn tight.

Whitman says:

> I am the sworn poet of every dauntless rebel the world over.
> I do not know what you are for (I do not know what I am for myself, nor what anything is for),
> But I will search carefully for it even in being foil'd,
> In defeat, poverty, misconception, imprisonment—for they, too, are great.
> Revolt! and still revolt!

American patriots, those in particular who would be considered sons or daughters of the Revolution, ought to bear tenaciously in mind that resistance to constituted authority, as well as intelligence and compromise, went into the making of our Constitution.

Intelligence, then, plays a lone hand. It is individualism rampant, and may stake livelihood, happiness, life itself against the opinions and concerted actions of a public horrified by the strangeness of its creations. It is a minor group trying to outplay the majority. It is youth and inexperience trying to outdo old age and wisdom. It is eccentricity successfully opposing the prevailing mode.

The judgments of society, like the verdicts of juries, are not always easy to predict, and are susceptible to strange and rapid

transmutation. Not more than a century ago a Unitarian could be stoned on the streets of Boston. To-day, a Unitarian is Chief Justice, a member of the most conservative branch of one of the most conservative governments in Christendom. John Brown's body hardly lay a-mouldering in the grave before his soul went marching on at the head of forces, military and political, which made possible Lincoln's "Emancipation Proclamation," a document destroying much private property, but, nevertheless, acceptable to what had become, by then, the dominant opinion in American politics. When Socrates was condemned to death, his moral teachings were, by due process of law, adjudged subversive of religion and good government, a source of corruption to youth. "When men revile you and persecute you, rejoice and be exceeding glad, for great is your reward in Heaven, for so persecuted they the prophets which were before you."

The non-conforming genius appears to lose; but once dead and safely buried, he lives in monument and story, the stakes he plays for being held by the unborn, while those who seemingly outplayed him join the unknown multitudes that survive, if at all, only in their progeny.

What, then, is success? It is the approbation of the many, or a few, now or at some future time. In the last analysis, it is what the individual himself deems worth while. Originality, therefore, is appreciated non-conformity. Intelligence is successful eccentricity. It is energy so controlled and directed that a worth while pattern of performance is created. Except for the necessity of conforming to some standard of appreciation, and it may be merely self-appreciation, intelligence is free initiative, unconstrained by definite ends. To exercise a man's intelligence, he must be left free to do what he desires; he must be given every opportunity to make mistakes, in the hope that he will profit by experience. If a child falls down, don't pick him up unless he is in imminent danger—let him learn to pick himself up. If men fall into error, don't correct them by telling them the truth; let them flounder in error until they find out the truth for themselves. This is Nature's way of promoting intelligence.

When our first schoolmaster entered the Garden of Eden in the guise of a serpent, and forced Eve to choose between innocence and knowledge, he made the oldest recorded test of human behavior, and Eve responded to it with intelligence. If this "first disobedience brought death into the world and all our woe," it also brought what we hold dear—civilization (we thought it worth fighting for), the home, the church, the state, our educational system, private property and the inventions of intellect and art. Without fully

realizing what she was doing, Eve rejected a life of ease, comfort and machinelike perfection, choosing the hard and devious path that led from Paradise to the civilized communities which harbor her descendants. Her choice assured them a life of toil, discontent and conflict, all the trouble necessary to exercise their intelligence, train their efficiency and develop their intellect. What more successful outcome would you ask of a simple venture into the unknown, inspired by hardly more than curiosity, motivated by discontent, and determined, it would seem, by the spirit of revolt against authority? Curiosity is the mother urge of science and truth; discontent awakens aspiration, and amongst the traits of character most frequently associated with creative imagination are ambition, audacity, aspiration, the love of adventure, and, most significant of all, a disregard of authority, leading perhaps to the defiance of privilege and public opinion. "He had every quality of a great commander except insubordination," Lord Fisher said of the British admiral who lost, or won, the battle of Jutland.

To teach a student to think for himself is to teach him to disregard authority, including his teacher's. For this reason it is not a common practice of the teaching profession, although it receives much enthusiastic verbal appreciation. Parents, however, are not at all hesitant about expressing their disapproval when a child produces some new idea contradicting well-established convictions. The father of Richard Feveril states a parental ideal in these words: "I require not only that my son should obey. I would have him guiltless of the impulse to gainsay my wishes." He would have added "opinions" could he have conceived it possible for these to be called in question.

Freedom of thought began with the liberty of conscience so outspokenly maintained by the Hebrew prophets, of whom the greatest was also the last, the apostle Paul, who borrowed the characteristic freedom of Hellenic thought to project a new religion. Christianity has fostered freedom of thought and action, though not excessively nor hurriedly. Intellectual, like material, possessions are acquired arduously, and, once acquired, they are held with the same bitter tenacity—the old time religion, the old Constitution, the ancient literature and even that intellectual absurdity—the old science. A mother recently wrote to the dean of a scientific school, asking whether a boy who studied engineering there would be exposed to the theory of evolution, because if this were possible, she proposed to send him to some other school. "Why does a professor have to introduce new and debatable topics for discussion in the classroom?" I have heard the question asked even in academic circles. "Isn't there a large enough body of safe

and sane knowledge to occupy his brief periods of instruction?'' No doubt the professor is free enough in some institutions to say what he wishes, but the joker is—the professor does not want to say what will subject him or his institution to hostile criticism. For this reason, university faculties do not make a brilliant display of creative intelligence in the intellectual field. Our educational system, as a whole, is distinguished by the conformity it promotes, the mental discipline it trains.

This, doubtless, is as it should be, for successful living is at least ninety-nine parts in a hundred conformity and constraint; only a very small fraction of one per cent. of a man's life can, at the very best, display freedom of thought and action. In no field, however, is it so important to keep the little freedom we have as in the field of intellectual production. And yet thought is so rigidly conformed in this country to 100 per cent. patterns that American genius is not conspicuous for intellectual originality. Some years ago I heard a professor at the University of Rome express the opinion that the development of big business in the United States was an outburst of creative energy similar to that which distinguished Italy during the Renaissance. Do not go to our universities to observe the best American intelligence in action; go out into the business world where great enterprises are successfully put over. There the atmosphere is one of freedom—even from the constraint of honesty and truth. This year the winner of the Nobel prize in literature is Anatole France, an avowed communist; another winner is Premier Branting, the leader of the dominant socialistic party in Sweden. Representative American contributions to art are movies and jazz bands, skyscrapers and railway stations. When America honors the free expression of new ideas without regard to their normalcy, intellectual originality, as well as mechanical invention, may become a conspicuous trait of American character.

The meeting place of intellect and intelligence is interesting. Imagination belongs to the category of intellect, and also to the category of intelligence. Creative imagination produces order out of chaos. As soon as a little child can use the kindergarten peg board, give him one and ask him to put the pegs into the board. He puts in the first one; where shall he put the second, beside the first or at a distance? This is the critical moment. If he puts it, let us say, beside the first, it must be to the right, to the left, above or below. He is now ready to put the third peg in position. If he does what he did with the second peg, he will make a row. A plan appears, a definite order is displayed. If he works without instruction he is producing an order of his own. He is doing

something that has meaning. He displays creative imagination. He is already beginning to develop an intellect. As the spider spins a web from his own body, so the human being weaves patterns of performance, establishes order, rises superior to chaos and produces standards of behavior based on knowledge. This employment of intelligence in intellectual organization is characteristically and typically human. I have tested chimpanzees and other apes, but have never known an ape to create a new order of his own. I have not seen a chimpanzee peg a straight line of his own accord, but I have observed little children doing it as soon as they could grasp the pegs and put them in place.

A civilization is a social order, the average developmental level of a group, it may be large or small. It is to be measured by the number and diversity of material and intellectual resources, but its chance of survival depends on intelligence, that is to say, on its ability to change. The social order of to-morrow is the invention of the few whose intelligence operates at a high intellectual level.

Change is the predominant characteristic of uterine life; stability, of the adult. At what age does the individual begin to stand pat? When does a man lose the ability to get a new idea, to change convictions or a point of view? At any age. Some, indeed, never get a new idea. They imitate in thought the prevailing modes of the social group to which they happen to belong, or to which they aspire. Fifteen, however, is an age at which a great number, perhaps the majority of those who do at least a little thinking of their own, harden into conventional patterns of thought and behavior. Others keep changing and growing intellectually up to thirty, some even up to forty-five, while just a few display to the very end that intellectual pliability which is intelligence informed by acquired knowledge.

A new individual begins to exist at conception with the union of a spermatozoon and an ovum. He will change more during the nine months of uterine life than in the remaining years of his existence. At birth, it has been estimated, he will possess only two per cent. of the original energy of development. He is like a clock, wound up at conception, which keeps running down until it stops at death. At twenty-one he comes of age, able to inherit the family property but already at six years of age he has entered into his heritage of human competency, and has begun to develop his natural resources of intellect and character, of intelligence and skill.

Age advances on a very uneven front. Long before the first gray hair or the first wrinkle, some congenital abilities have hardened into particular modes of behavior. It is then difficult, if not impossible, to change old habits for new. A child, for example,

having learned one language with ease, inclines to stand pat on his accomplishment. He appears to lose some of his original pliability, offers resistance to the acquisition of another language, develops a sort of organic obstinacy, in other situations called "constitutional conservatism." From infancy on, efficiency is being acquired at the expense of general competency. Problems are solved with increasing accuracy and speed, but the ability to solve new problems is greater at the age of six years than at any later period. Youth combines the plasticity of initiative with the efficiency of acquired skill, and thus produces the successful inventions from which a new order is evolved. Old age brings wisdom, but is handicapped by a deficiency of initiative and dislike of change. The vitality of a civilization is directly proportional to the creative intelligence of its young men and young women.

Observation of the behavior of children and adults leads to the conclusion that education can not make the stupid intelligent. Intelligence is a congenital though not inherited endowment, and the amount of it can not be increased by training. Genius is not a product of breeding; its appearance is in the hands of the gods, a result of the fortuitous combination of qualities possessed by the germ plasms entering into the conception of a new individual. The chief condition which appears to favor superior intelligence is the variety of race and family mixture. The more mongrel a people, the more intelligent; the purer the blood, the more stupid. Intelligence would seem to require an inner conflict of cross purposes and opposing impulses. Neither the Jew, the Anglo-Saxon, the Irish, the French, the Italian nor the American is pure-blooded, in comparison with the Prussian Junker, whose blood is purer and older than the oldest of first families in England or America.

In an essay on "Race and Tradition," written more than twenty years before the great war, Darmesteter, a Frenchman, says of Germany: "The misfortune of Germany—what constitutes her momentary strength and will bring about her lasting weakness in the future—is that the element of race is better preserved there than elsewhere. Hence, narrowness of spirit, lack of proportion in her intelligence, of justice in her heart. She lacked that fruitful struggle of contrary forces that limit their excesses by complementing their energies, and that, in recognizing their mutual rights, enlarge the innate narrowness of man, with the result of producing something that has the extent and variety of Nature herself. Germany has remained, and still remains, a thing strangely powerful and painfully incomplete." [1]

[1] Selected Essays, translated by Helen B. Jastrow.

Two hundred years ago, the author of "Robinson Crusoe" paid his respects to those who tried to mobilize the race prejudice of "true born Englishmen" against the followers of William of Orange, in words that some of our "hundred per cent. Americans" might ponder with profit:

> These are the heroes that despise the Dutch,
> And rail at new-come foreigners so much;
> Forgetting that themselves are all derived
> From the most scoundrel race that ever lived;
> A horried crowd of rambling thieves and drones
> Who ransacked kingdoms and dispeopled towns;
> The Pict, and Painted Briton, treach'rous Scot;
> By hunger, theft, and rapine, hither brought;
> Norwegian pirates, Buccaneering Danes,
> Whose red-haired offspring everywhere remains,
> Who join'd with Norman French, compound the breed,
> From whence your true-born Englishmen proceed.

There are those who fear for civilization. Of what are they afraid? Civilization is not necessarily threatened, whether by imperialists or communists; *our* civilization may be—the aggregate of our material and intellectual possessions. Creative intelligence, however, is indifferent to the language which transmits the intellectual fruits of man's genius—whether it be Anglo-Saxon or Prussian, Latin or Slav, indifferent even to the color of the hand that bears aloft the torch of enlightenment and progress, let it be yellow, white or black. So far as intelligence and progress are concerned, the future is a sporting proposition, and the sportsman's attitude is to let the best man win.

The general aim of civilization is dominion over nature—the more efficient control of natural forces. There are doubtless some who still think that man's subjection to nature is a law of God, and that a social order once established must not be changed. Progress, however, is inevitable, though privilege and authority, timidity and prejudice will always oppose the creative advance of intelligence. To defy the spirit of progress in the name of either religion or law is superstition; the true prophet is a poet who sees in creative evolution the display of divine intelligence.

What the world needs to-day is more of the optimism of the progressive and a little less of the pathological fear of the standpatter, more faith in creative evolution, more hope of reaching yet higher levels of achievement and more of that freedom from prejudice called charity, another name for love, the productive passion.